

**REMARKS**

Review and reconsideration on the merits are requested.

**Election/Restrictions**

The Examiner correctly characterizes the election.

**Specification**

The specification was quickly checked to page 24 (the bottom of the page). It seemed to be in good shape and no further checking was done. If the Examiner wants a further checking of the specification, the Examiner is requested to telephone the undersigned.

**The Prior Art**

WO02/078840 Fukunaga et al (Fukunaga using U.S. 7,378,368 B2 as an English translation); U.S. 4,206,134 Kugler et al (Kugler); U.S. 6,383,273 B1 Kepner et al (Kepner).

**The Art Rejections**

Various art rejections are posed in the present Action. They are discussed in the order presented. The Examiner's position is set forth in the Action in substantial detail and will not be repeated here except as necessary to an understanding of Applicants' traversal which is now presented.

**Rejection of claims 1, 2-4 and 15-20 as obvious over Fukunaga.**

**Traversal**

The Examiner is first requested to review the amendments to claim 1.

The present claims distinguish Fukunaga in an unobvious manner for the following reasons.

Fukunaga discloses a catalyst comprising alumina, manganese oxide, ruthenium and an

alkali metal (sodium), as urged by the Examiner. However, the Fukunaga catalyst is not a catalyst for producing hydrocarbons, rather, is a catalyst for reforming hydrocarbons.

Hydrocarbon production:  $H_2 + CO \rightarrow \text{Hydrocarbon}$

Hydrocarbon reforming:  $\text{Hydrocarbon} \rightarrow H_2 + CO$

Thus, there is a substantial difference in utility between Fukunaga and the present invention.

For the measurement of pore characteristics, the present invention employs an  $N_2$  gas adsorption method, while Fukunaga employs a mercury intrusion method. The  $N_2$  gas adsorption method can generally be used to measure the distribution of pore diameters in the range from micropores (2 nm or smaller) to mesopores (2 to 50 nm), while the mercury intrusion method is used to measure the distribution of mesopores and mainly macropores (50 nm or larger).

The pore characteristics recited in the present claims are of micropores and mesopores, and cannot be directly compared with those of Fukunaga. The alumina which Fukunaga employs is  $\alpha$ -alumina as recited in claim 3 of Fukunaga, and its surface area and pore volume are considered to be very small and different from the pore characteristics as recited in the present claims.

Thus, at this point, the present invention differs substantially from Fukunaga.

Applicants assume, however, for purposes of discussion, that the aluminum oxides disclosed in Fukunaga are, in fact, the same as those employed in the present application.

Fukunaga teaches that a part or all of the aluminum oxides are preferably  $\alpha$ -alumina (see claim 3 and the specification). KHO-24 is also converted into  $\alpha$ -alumina obtained by calcination at a high temperature. It is thus very likely that the  $\alpha$ -alumina of Fukunaga would have a specific

surface area and a pore volume which are so small as not to fall within the pore characteristics as recited in the present claims.

Applicants offer the following arguments regarding the specific surface area and pore volume of Fukunaga.

Alumina changes its phase under heat treatment and turns to  $\alpha$ -type when heated at a high temperature. With a rise in temperature, small pores are sintered. Accordingly, alumina has a smaller surface area as its sintering makes its pores larger. Generally,  $\alpha$ -alumina has a specific surface area of several to dozens of  $\text{m}^2/\text{g}$ . As regards pore diameter, generally  $\alpha$ -alumina has a primary particle size of 0.1  $\mu\text{m}$  (100 nm) or larger and  $\alpha$ -alumina hardly has any pores known as micropores (2 nm or smaller) or mesopores (2-50 nm), which are characteristic the present invention. As Fukunaga does not contain any specific disclosure concerning specific surface area or pore diameter of alumina, no direct comparison is possible in pore characteristics between Fukunaga and the present invention, but it is generally true that  $\alpha$ -alumina has a very small specific surface area and hardly has any micropore or mesopore.

Applicants now focus on:

**Drying and Supporting the Catalyst.**

Fukunaga only teaches that drying is carried out, and that calcining is preferably not carried out after component (a) (ruthenium) is supported, since calcining results in oxidation, scattering and coagulation (col. 8, lines 31-38) thereof. In distinction, the present invention is characterized by calcining after alkaline treatment.

Applicants thus respectfully submit that Fukunaga **teaches again** the present invention.

Applicants next address:

### **Aqueous Alkaline Solution Treatment**

Applicants assume Fukunaga discloses the same aqueous alkaline solution treatment as presently claimed. However, it is carried out for removing salts (for example, chlorine when an aqueous solution of ruthenium chloride is used), while calcining is preferably not carried out after drying, as stated above. Fukunaga does not disclose drying and calcining after aqueous alkaline solution treatment, i.e., the disclosure regarding catalyst preparation in the Examples of Fukunaga includes only drying at 80°C.

Thus, Fukunaga differs from the present claims at this additional point and for this additional reason cannot render the claims herein obvious.

Applicants now address:

### **Calcination at 400-800°C**

Fukunaga teaches calcining in a non-oxygen inert gas (nitrogen or argon) when calcining is carried out (for removing salts) (col. 8, lines 58-61), though calcining is preferably not carried out as stated above.

In distinction, the present invention is characterized by calcinations in the air after aqueous alkaline solution treatment as set forth in claim 1.

The Inventors herein respectfully submit that one of ordinary skill in the art would not have been motivated to increase the drying temperature of Fukunaga to carry out calcination in the air after aqueous alkaline solution treatment. Thus, contrary to the Examiner's allegation that one of ordinary skill in the art would have found it obvious to modify the treatment of the catalyst of Fukunaga "*by increasing the temperature of the drying*", Applicants respectfully submit that one of ordinary skill in the art would accept the fact that drying is not the same as calcining, i.e., these are two separate and distinct well-accepted different procedures in the art, and more than a mere difference in temperature is involved as urged by the Examiner.

In fact, the Comparative Examples in the present specification confirm that satisfactory results cannot be obtained with only drying after aqueous alkaline solution treatment; calcining in the air without alkaline solution treatment; or calcining in an inert gas atmosphere after aqueous alkaline solution treatment.

Applicants offer the following discussion in support of the argument in the preceding paragraph.

Applicants are of the opinion that treatment of a catalyst with an alkaline aqueous solution turns ruthenium into ruthenium hydroxide (for example, aqueous ammonia treatment of a catalyst of ruthenium chloride produces ruthenium hydroxide, as follows:  $\text{RuCl}_3 + 3\text{NH}_4\text{OH} \rightarrow \text{Ru}(\text{OH})_3 + 3\text{NH}_4\text{Cl}$ ). Applicants thus assume that hydroxyl groups are also formed on the surface of a support of alumina and manganese oxide, and that the hydroxyl groups of ruthenium hydroxide and those of the support act on each other. Calcining in the air turns ruthenium hydroxide into ruthenium oxide, as is clear from XRD analysis. Applicants believe that the results of the present invention require the mutual interaction of the hydroxyl groups of the ruthenium hydroxide and support (active species) prior to calcination and the subsequent oxidation of the active species by calcination.

Therefore, they conclude that the results of the present invention cannot be obtained from calcination of a catalyst prior to treatment with an aqueous alkaline solution, since there is no mutual interaction of hydroxyl groups, and that the results of the present invention cannot be obtained using a dry or inert gas atmosphere, since no oxidation of active species occurs.

Withdrawal of the rejection over Fukunaga is requested.

**Rejection of Claims 1 and 2 as obvious over Kugler.**

**Traversal**

For purposes of discussion, Applicants assume that the Examiner's conclusion regarding the amount of ruthenium in Kugler is correct.

However, Kugler does not disclose any other features of the present invention, i.e., aqueous alkaline solution treatment, calcination thereafter, or the use of alumina satisfying the specific pore requirements.

Kugler teaches that a purpose of mixing alumina is to improve the specific surface area of the support and thereby the dispersion of ruthenium supported thereon. Accordingly, Kugler discloses that manganese oxide is mixed with other substance having a high specific surface area.

As one of ordinary skill in the art would appreciate, a support having a high specific surface area generally has a small pore diameter, as smaller pores make a larger surface area. The pore structure of the alumina in the support as presently claimed is characterized by the specific proportion or more of the pore volume defined by pores having a relatively large diameter. A high specific surface area is not considered important in Kugler. Kugler does not teach the importance of the pore structure of aluminum oxide as claimed.

Applicants respectfully submit that what the Examiner has done is to essentially take an "inherency" position regarding Kugler, but the Examiner has offered no support for the conclusion of inherency. Applicants respectfully submit that in this situation the Examiner has not carried his burden to shift the burden of proof to Applicants, and the rejection based on Kugler is legally flawed.

Further, Kugler does not disclose characteristic (1) or (2) in present claim 1 herein. This further emphasizes, Applicants respectfully submit, the basic legal incorrectness of the Examiner's inherency rejection based on Kugler.

Withdrawal of the rejection based on Kugler is requested.

**Rejection of Claims 1, 2-4 and 15-17 as Anticipated by or,  
in the Alternative, as Obvious Over Kepner**

**Traversal**

Kepner appears to teach an oxide of ruthenium, an alkali metal, a rare earth metal, manganese or aluminum used as a support for a biocidal compound, such as a silver or copper, but does not teach the catalyst as claimed in the present claims.

Specifically, the portions of Kepner relied upon by the Examiner do not in any fashion suggest or disclose characteristic (1) of present claim 1 herein, namely, the use of an aqueous alkaline solution treatment and calcination.

Further, the Inventors believe that it is logical to assume that the median pore size in Kepner means the pore diameter at which the pore volume shows a half value in a graph plotting the integrated values of the pore volume against the pore diameter. Applicants respectfully submit that it would be unreasonable to conclude that Kepner discloses characteristic (2) in the present claim 1, based solely on the median pore size of 3.5-35 nm.

The amounts at col. 14, lines 16-36 (0.1-99.9% support, 0.1-99.9% biocidal compound) are very wide and would overlap or include the amounts as claimed. However, Kepner differs from the present invention in that the oxides of ruthenium, manganese and aluminum are all used for the support, as earlier pointed out.

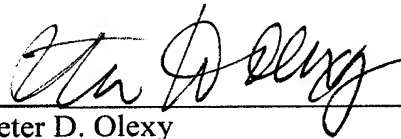
Withdrawal is requested.

**Miscellaneous**

The translation error of hyalite is corrected to bayerite in the specification

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Respectfully submitted,



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